

specification on page 8 to show that the conduit may be a steam pipe of a building heating system or a process feed gas pipe of a chemical plant. No new matter has been added because a patent application disclosure includes the originally filed claims, and originally filed claims 9 and 10 include these features. See MPEP §§6.801(l) and 2163.07.

The Examiner rejects claims 1-5, 7-8, and 12-15 under 35 U.S.C. §102(b) as being anticipated by U.S. Patent No. 4,528,857 to *Bruner*.

The background of *Bruner* describes a “tag” ultrasonic flow meter. See *Bruner* col. 1, lines 46-62. *Bruner* then forsakes the tag flow meter and instead teaches a phase modulation ultrasonic flow meter requiring turbulence in the fluid. It is clear that *Bruner* is aware of the tag method, yet does not utilize antiparallel ultrasonic beams with the tag method, and the Examiner is not permitted to base a rejection on part of a reference if other parts of the reference are necessary to fully appreciate the teaching of the reference.

It is impermissible within the framework of §103 to pick and choose from any one reference only so much as will support a given position, to the exclusion of other parts necessary to the full appreciation of what such reference fairly suggests to one of ordinary skill in the art. See *In re Hedges*, 783 F.2d 1038, 228 USPQ 685, 687 (Fed. Cir. 1986)(citations omitted).

Although *In re Hedges* was decided in the context of a rejection under 35 U.S.C. §103, the reasoning behind the reversal of the rejection applies here. *Bruner* unambiguously teaches those skilled in the art a phase modulation ultrasonic flow meter, and *Bruner* does not disclose, teach or suggest combining the use of tag with the use of antiparallel ultrasonic beams, in contrast to the claimed invention.

Additionally, *Bruner* does not disclose (or teach) every element of the applicant’s claimed invention.

<u><b>Bruner discloses and teaches:</b></u>	<u><b>The applicant's claimed invention includes:</b></u>
-a phase modulation ultrasonic flow meter;	-an antiparallel <u>tag</u> flow measurement system;
-transmitting and receiving transducer pairs which are diametrically disposed on the outside of a conduit which, after filtering, have their <u>output signals combined</u> in a differential amplifier;	-correlates tag-modulated signals;
-frequency meters or RMS volt meters used to measure either the zero crossing <u>frequency</u> or <u>amplitude</u> of the resulting voltage signal, both quantities being <u>nearly linearly related to the fluid flow rate</u> ;	-a processor or a correlator to determine a <u>time interval</u> between tag modulated signals, the time interval being <u>indicative of flow</u> ;
-reliance exclusively on turbulence.	-inhomogeneities <u>or</u> turbulence in the fluid itself <u>or</u> matter such as bubbles, droplets, <u>or</u> particles that are moving in the fluid flow constitute "tags" that modulate the ultrasonic signal.

Compare the *Bruner* Abstract and *Bruner* at col. 3, lines 58-62 and col. 2, lines 3-5, with the applicant's independent claims 1,8, and method claim 13, the latter combining the use of anti-parallel signal paths with tag modulated outputs. See also the application at page 1, lines 10-13 regarding "tags".

Prior art is anticipatory only if every element of the claimed invention is disclosed in a single item of prior art in the form literally defined in the claim.

See Atlas Powder Co. v. DuPont, 750 F.2d 1569, 224 USPQ 409 (Fed. Cir. 1984); American Hospital Supply v. Travenol Labs, 745 F.2d 1, 223 USPQ 577 (Fed. Cir. 1984).

It is clear that every element of the applicant's claimed invention is not disclosed in *Bruner*.

*Bruner* is implicitly talking about liquids when he refers to fluids. This is apparent from col. 1, lines 18-22: "...which are used...". *Bruner* is not saying "which might be used." At the time his U.S. patent was filed (July 25, 1983) the three "non-invasive ultrasonic flowmeters" that he mentions had been used only to measure liquid flows, not gases. *Bruner's* teaching for liquids is further indicated by his choice of frequencies, e.g. in col. 3, line 23: "...2 MHz...". The applicant's claimed invention applies to gases as well as to liquids.

Also, as noted, *Bruner's* invention relies on turbulence. *Bruner* states in col. 3, lines 63-64 of "those components of the instantaneous fluid velocity." Another way of saying essentially the same thing, is to speak of "turbulence intensity," a term defined in fluid dynamics, as known to one skilled in the art from available literature. An ultrasonic noninvasive flowmeter based on the principle of tag can work even when there is no turbulence. For example, it can work on inhomogeneities present in a two-phase fluid like water plus some air bubbles, flowing at a Reynolds number less than 2000, i.e., laminar flow.

Therefore, when *Bruner* discloses (as in claim 1, line 2) "...a fluid ...having turbulent flow..." *Bruner* describes a liquid flowing fast enough to be turbulent, e.g. Reynolds numbers greater than ten to the fourth power or 10,000, as indicated in *Bruner* at col. 5, line 47.

Moreover, in *Bruner* the dual loop of Fig. 1 and the single loop of Fig. 2 are mentioned as if these are merely alternative embodiments. See also col. 5, lines 59-60: "Fig. 2 illustrates another possible embodiment ...". According to col. 2, lines 48-49 *Bruner* "uses a single loop to accomplish the same results". The spacing between the paths in the dual loop of *Bruner* plays no role in the calculation of flow, in contrast to the tag flowmeter of the applicant's invention. *Bruner* recognizes the role of spacing in tag in the equation in col. 1, line 62. However, *Bruner* gives no equation for his own flowmeter but instead implies that calibration is required, with the

words: "...which can be calibrated to indicate the fluid flow rate." See *Bruner* col. 2, lines 46-47. Absent any equation and absent any calibration it is hard to see how the *Bruner* device could measure flow to any specific level of accuracy. *Bruner's* implied calibration likely would relate the "average frequency with which turbulent flow modulates the transmitted ultrasonic beam" (col. 5, lines 40-42) to the flow. In the art this means calibrate flow in terms of turbulence. *Bruner's* average frequency may be understood from his general remarks throughout the '857 specification or from literature in the field, to be a measure of the level of turbulence, which after calibration, according to *Bruner*, would be used as a measure of flow. Higher turbulence means higher flow.

In contrast, the applicant uses the tag principle and times the passage of a modulation effect from one station to another, axially displaced by a spacing  $L$ .

It is clear that *Bruner* teaches not only different structure but an entirely different principle for measurement of flow. *Bruner* points out that since the ultrasonic beams are transmitted in antiparallel directions, the phase modulation of each beam attributable to transverse fluid flow components will have equal magnitudes but opposite signs with respect to each beam. However, the inventor of the subject invention recognized that modulation in either direction is so nearly the same, despite some axial separation  $L$ , that cross correlation or "tag", is possible. *Bruner* does not disclose or teach significance in connection with the distance between the transducers, and like his failure to combine his flowmeter with the tag method, and his lack of teaching with respect to determining a time interval, it is clear that *Bruner* does not teach determining flow through the principle of, by the method of, or with the structure of the applicant's claimed invention.

Accordingly, *Bruner* does not anticipate the applicant's claimed invention and claims 1-

5, 7-8 and 12-15 are in condition for allowance.

The Examiner also rejects claims 6 and 9-11 under 35 USC §103(a) over *Bruner*, stating in a conclusory manner that the additional features claimed in claims 6 and 9-11 would have been obvious. Claims 6 ultimately depends from independent claim 1, and claims 9-11 depend from independent claim 8, and thus claims 6 and 9-11 are allowable for the reasons discussed above.

#### CONCLUSION

Each of the Examiner's rejections has been addressed or traversed. Accordingly, it is respectfully submitted that claims 1-15 are in condition for allowance. Early and favorable action is respectfully requested.

If for any reason this Response is found to be incomplete, or if at any time it appears that a telephone conference with counsel would help advance prosecution, please telephone the undersigned or his associates, collect in Waltham, Massachusetts, (781)890-5678.

Respectfully submitted,

A handwritten signature in black ink, appearing to be 'Kirk Teska', written over a horizontal line.

Kirk Teska  
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